MTBE's Effects

A Sensitives Issue

In response to the 1990 Clean Air Act, oxygenators such as MTBE (methyl tertiary butyl ether) were added to fuels in concentrations up to 15% in order to reduce carbon monoxide pollution. It was only when acute health complaints—an increase in headaches, nausea, and eye, nose, and throat irritations—surfaced following this increase in MTBE use that researchers began to study the possible health effects of the compound. Earlier studies had looked at the effect of pure MTBE on healthy individuals. However, a study by Nancy Fiedler and colleagues at the University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School in Piscataway, New Jersey, is the first to study controlled exposures of individuals to MTBE in gasoline vapor at concentrations that mimic real-life exposures such as refueling or driving situations [*EHP* 108:753–763].

The researchers compared the symptoms, psychophysiologic reactions, and neurobehavioral performance of two experimental groups during exposure to four controlled exposure conditions: clean air, regular gasoline fumes, and fumes of gasoline containing either 11% or 15% MTBE. Researchers compared one group of 12 individuals selected based on their self-report of symptoms associated with MTBE exposure with another group of 19 control individuals without self-reported sensitivities.

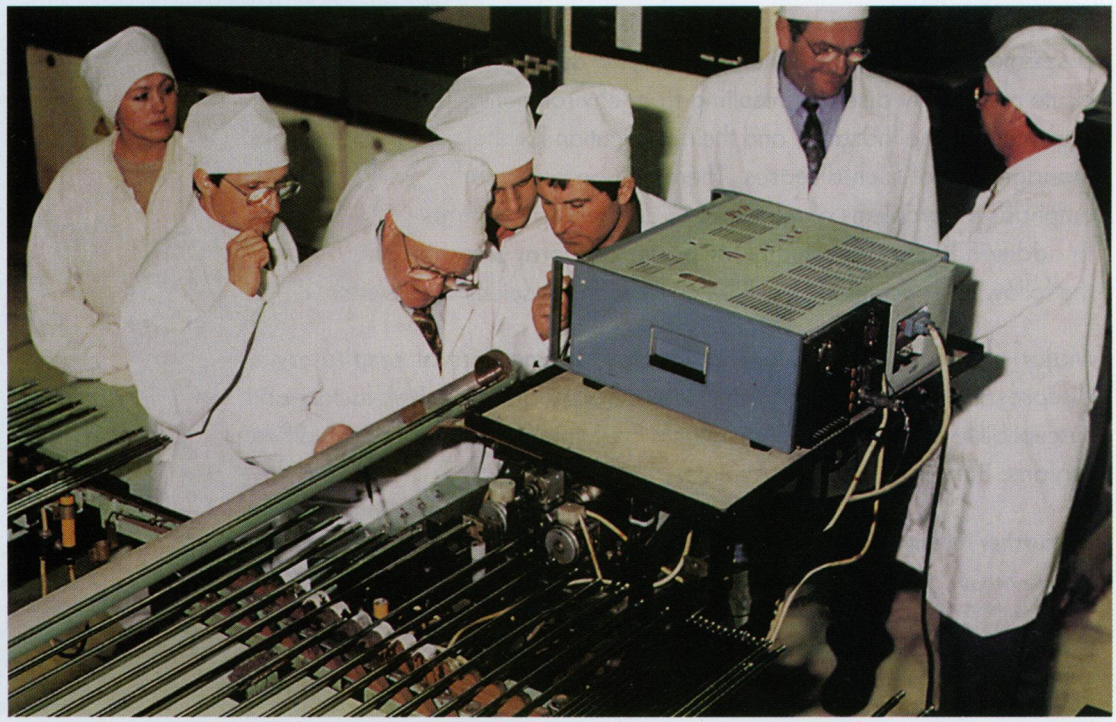
The exposures occurred one week apart and took place in a controlled-environment facility. After a 5-minute relaxation period known as the baseline period, subjects were exposed for 15 minutes to one of the four exposure conditions. After each exposure, subjects rated their experience of 42 different symptoms associated with MTBE and solvent exposure, anxiety, depression, and breathing problems. They also rated the testing environment on factors that might have affected their symptom reports, and completed odor questionnaires assessing the intensity of and irritation caused by the gasoline odor in the room at the time. The subjects took a computerized driving test to test the effects of MTBE on functions such as reaction time and peripheral vision. Researchers measured psychophysiologic responses, finger temperature, finger pulse volume, and the percentage of carbon dioxide in exhaled breath (an indicator of hyperventilation), and the measures were compared to those taken during the baseline period. Before departing each day, subjects were asked to guess which exposure condition they had experienced during that session.

The researchers found that, compared with the control group, the group of sensitives reported significantly more total symptoms when exposed to gasoline with 15% MTBE than when exposed to gasoline with 11% MTBE, plain gasoline, or clean air, although there were no significant differences in neurobehavioral performance or psychophysiologic responses. The self-reported sensitives group also reported higher total symptoms than the control group during every exposure condition, as well as during the baseline period before any exposures. Researchers believe the latter finding suggests heightened sensitivity among this group, regardless of exposure.

The researchers observed no significant differences among the two groups in symptoms, neurobehavioral performance, or psychophysiologic responses when exposures to gasoline with 11% MTBE were compared with exposures to regular gasoline and clean air. According to this study, these results do not support a dose response to MTBE. And, even though the self-reported sensitives did report increased symptoms during exposure to the gasoline with 15% MTBE, the researchers found that the exposure did not impair performance or cause psychophysiologic changes. They also found that neither group could accurately identify specific exposure conditions. At the very best, they could distinguish only between clean air and gasoline exposures.

According to the researchers, it is possible that MTBE, when mixed with gasoline, produces a different effect than that observed with exposure to pure MTBE. They also concede the possibility that using longer exposure periods or conditions that reflect ongoing exposure while driving may show greater effects on performance. To better understand reported health effects, the researchers say, direct testing of subgroups reporting unexpected symptoms in response to low-level exposures may be necessary. **–Jennifer Medlin**

They also caution that these findings need to be confirmed by further follow-up of the present group. Nonetheless, each such study is important because it contributes information about the potential carcinogenicity of specific radionuclides prevalent in the nuclear materials work environment. **–Dade W. Moeller**



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Something in the air. People who work with nuclear materials, such as these fuel rod assembly workers, may be at increased risk for developing certain cancers due to inhalation of airborne radioactive matter.